UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/034,296	12/21/2001	Christopher J. Stepanian	ASPEN 113 US	9746

20350 7590 08/10/2005

TOWNSEND AND TOWNSEND AND CREW, LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER	
BOYD, JENNIFER A	
ART UNIT	**PAPER NUMBER**
1771	

DATE MAILED: 08/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/034,296	STEPANIAN ET AL.
	Examiner	Art Unit
	Jennifer A. Boyd	1771

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The Applicant's Amendments and Accompanying Remarks, filed May 19, 2005, have been entered and have been carefully considered. Claims 1 – 48 are pending. In view of Applicant's Remarks and in light of the Interview conducted May 5, 2005, the Examiner withdraws all previously set forth rejections as detailed in the Office Action dated February 10, 2005. The invention as currently claimed is unpatentable for reasons herein below.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. Claims 1 – 32 and 38 – 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramamurthi et al. (US 5,306,555) in view of Frank et al. (US 2003/0077438).

Ramamurthi is directed to an aerogel matrix composite (Title) having improved mechanical strength, relatively good moisture resistance, a range of flexibility and good thermal resistance. The flexibility of this material makes it possible to easily replace insulation material for houses and for insulation in jacket form in applications up to 700 degrees Celsius (column 16, lines 10 – 20).

As to claims 1 and 12, Ramamurthi teaches a gel matrix of monolithic aerogels reinforced with long or short fibers, whiskers, mineral wool, glass wool and particles (column 4, lines 1 – 20). Ramamurthi teaches the fibers may be randomly distributed or oriented and in the

form of mats, sheets or nonwoven among other forms (column 4, lines 25 – 40). Ramamurthi notes that the composite gel matrix has good rigidity or flexibility based on the required application (column 2, lines 1 – 15).

As to claims 2 – 3 and 13 - 14, Ramamurthi teaches that the aerogel matrix can comprise inorganic gel forming material such as TiO_2 (titania), SiO_2 (silica) and ZrO_2 (zirconia) (column 4, lines 1 – 15).

As to claim 4, Ramamurthi teaches that the aerogel matrix can comprise an organic gel made from formaldehyde and resorcinol or resorcinol and melamine (column 15, lines 20 – 30).

As to claims 7 and 8, Ramamurthi teaches that the matrix also contains TiO_2 (titania) pigment (column 4, lines 18 – 20), which can function as Applicant's "dopant".

Ramamurthi teaches the claimed invention above but fails to disclose that the fibers of the reinforcing sheet or mat may be in the form a lofty fibrous batting as required by claims 1 and 12. Ramamurthi fails to teach that the fibers making up the lofty fibrous batting have a diameter of about 0.1 to 100 microns and are crimped fibers evenly dispersed throughout the composite as required by claims 11. Ramamurthi fails to teach that the reinforcing structure comprises a lofty fibrous batting and microfibers having diameters between 0.1 to 100 microns and aspect ratios of greater than 5 as required by claim 19. Ramamurthi fails to that the microfibers are selected from the group consisting of carbon fibers and copper fibers as required by claim 25. Ramamurthi fails to teach that the properties vary within the composite such as microfiber material, microfiber size, microfiber aspect ratio and microfiber quantity as required by claim 26. Ramamurthi fails to teach that a metal foil is added on the x-y axis of the composite

which has high thermal conductivity equal to or greater than 1 W/mK as required by claim 27 – 28 and 31 - 32. Ramamurthi fails to disclose that the fibers of the reinforcing sheet or mat may be in the form a lofty fibrous batting and comprises one or more high thermal conductivity material such as a metal foil having a thermal conductivity equal to or greater than 1 W/mK as required by claims 38 – 39 and 42 - 43.

Frank is directed to a composite aerogel material that contains fibers (Title). Frank teaches a composite material that contains 5 – 97% by volume of aerogel particles and at least one fiber material (Abstract). The fibers can be straight or crimped and in the form of wadding (page 2, [0020]). It should be noted that according to Merriam Webster Dictionary, "wadding" is defined as a soft mass or sheet of short loose fibers used for stuffing or padding. The Examiner equates the "wadding" to Applicant's "lofty fibrous batting". Frank notes that the product of the present invention is mechanically stable, displays good acoustic dampening properties (insulating properties) and that the use of very fine fibers in the composite results in a flexible material (page 2, [0014] and [0022]). It should be noted that Frank teaches *at least one* fiber material, therefore, the reinforcing structure can contain more than one type of fiber. Frank teaches that the fibers can be natural fibers, synthetic, inorganic fibers such as glass, mineral, silicon carbide or carbon fibers (page 2, [0019]). In one embodiment, the reinforcing structure can contain carbon fibers and batting-type fibers such as natural or synthetic fibers. The fibers have diameters between 0.1 μm and 1 mm (1,000 μm) (page 2, [0023]). The fibers have a length greater than the mean diameter of the aerogel particles, therefore, they must be at least 0.5 mm (or 500 μm). It should be noted that the aspect ratio is the ratio between the length of a fiber and

the diameter of the fiber. Using the parameters given by Frank, the aspect ratios will range from 0.5 – 5000, which satisfies the Applicant's requirement. Frank teaches that carbon fibers can be used in the reinforcing structure. As to claims 21 – 24, according to Applicant's Specification on page 15, the carbon fibers would resist sintering and reduces transmission of IR radiation more than the lofty fibrous batting. Additionally, carbon fibers are known in the art to attenuate radio frequency waves and electromagnetic waves. Frank teaches that mixtures of the types of fibers can be used (page 2, [0025]) implying that the material, size, aspect ratio or microfiber quantity can vary. Frank teaches that the composite is a mechanically stable material of very low thermal conductivity (page 2, [0018]). Frank lists that natural fibers such as cotton, cellulose and flax as fibers which are useful in the wadding material and that are known in the art to have low thermal conductivity as required by claim 5. As to claims 27 – 28 and 31, Frank teaches that a covering layer(s), equated to Applicant's "material having high thermal conductivity", can be attached to at least on side of the composite (page 3, [0048]). Frank teaches that the covering layer(s) can be a metal film (page 4, [0049]). It is known in the art that a film is a type of sheet material and that a metal has high thermal conductivity. As to claim 32, Frank teaches that a covering material can be applied on the top and/or bottom surface of the composite (page 3, [0048]); the top and bottom surfaces would be in the x-y plane of the composite.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Frank's wadding, or "lofty batting", as the fibrous mat into the aerogel structure of Ramamurthi motivated by the desire to create a composite having superior thermal and insulating properties.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a metal foil to the x-y axis as suggested by Frank of the composite of Ramamurthi motivated by the desire to improve the surface properties of the composite.

As to claim 5, it should be noted that the transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps "and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. In re Herz, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976). The burden is upon the Applicant to show that the additional components do affect the basic and novel characteristics of the invention. For the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See MPEP 2111.03.

As to claims 30 and 41, Frank teaches that the covering layers can be made of metal films (page 4, [0049]). Frank fails to teach that the metal films can be made from copper or steel. It would have been obvious and necessary for one of ordinary skill in the art practicing the invention of Frank to provide the details of the metal film. As steel and copper are commonly known metals in the art which are malleable and have high thermal conductivity, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use steel or copper films in the invention of Frank, motivated by the expectation of successfully practicing the invention of Frank.

As to claims 6, 9 – 10, 12 and 17 - 18, Ramamurthi in view of Frank discloses the claimed invention except for the lofty batting has a sufficient quantity of fibers in its z axis to provide loft yet not so many that the insulating properties are comprised by the z axis fibers acting as thermal conduits as required by claim 6, the dopant is present in an amount of 1 – 20% by weight of the total composite as required by claim 9, the cross-sectional area of the fibers of the batting visible in a cross-section of the composite is less than 8% of the total surface area as required by claim 10 or less than 10% as required by claim 12 of that cross section, the batting has a density of about 0.1 to 16 lbs/ft^3 as required by claim 17, the batting has a density of about 2.44 to 6.1 lbs/ft^3 as required by claim 18. It should be noted that the quantity of fibers, amount of dopant, cross-sectional area of fibers visible and batting density are result effective variables. For example, as the quantity of fibers and density increases, the batting becomes more lofted. As the diameter of the fibers decrease, the material becomes more flexible. As the aspect ratio increases, the length in relationship to the diameter increases. As the amount of dopant increases, conductivity increases. As the visible cross-sectional area increases, the properties of the batting changes. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the lofty batting has a sufficient quantity of fibers in its z axis to provide loft yet not so many that the insulating properties are comprised by the z axis fibers acting as thermal conduits as required by claim 6, the dopant is present in an amount of 1 – 20% by weight of the total composite as required by claim 9, the cross-sectional area of the fibers of the batting visible in a cross-section of the composite is less than 8% of the total surface area as required by claim 10 or less than 10% as required by claim 12 of that cross section, the batting has a density of about 0.1 to 16 lbs/ft^3 as required by claim 17, the batting has a density of about

2.44 to 6.1 lbs/ft^3 as required by claim 18 since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In the present invention, one would have been motivated to optimize the density, amount of fibers in the z axis, level of dopant, the size of the fibers, the aspect ratio and surface area of fibers to create a composite with the proper level of conductivity and loft.

As to claims 5, 15 – 17, 20, 29, 38 and 40, although Ramamurthi in view of Frank does not explicitly teach the claimed batting is compressible by a minimum of 50% of its thickness and is sufficiently resilient that after compression for about 5 seconds it returns to at least 75% of its original thickness as required by claim 15, the fibrous batting is sufficiently lofty that it retains at least 50% of its thickness after addition of the gel forming liquid to form the monolith as required by claim 16 and compressible by at minimum of 65% and returns to at least 75% of its original thickness as required by claim 17, a thermal conductivity of less than 50 mW/mK as required by claim 5, the microfibers are comprised of a material having a thermal conductivity below about 200 mW/mK as required by claim 20, the high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 29, the high thermal conductivity material has a thermal conductivity equal to or greater than 1 W/mK as required by claim 38 and high thermal conductivity material is a metal which is sufficiently malleable to provide conformability to the composite to enable the composite to retain its shape after bending as required by claim 40, it is reasonable to presume the above properties are inherent to

Ramamurthi in view of Frank. Support for said presumption is found in the use of like materials (i.e. a lofted batting and conducting fibers within an aerogel monolith) which would result in the claimed properties. The burden is upon the Applicant to prove otherwise. *In re Fitzgerald* 205 USPQ 594. In addition, the presently claimed properties would obviously have been present once the Ramamurthi in view of Frank product is provided. Note *In re Best*, 195 USPQ at 433, footnote 4 (CCPA 1977).

4. Claims 33 – 36 and 44 – 47 are rejected under 35 U.S.C. 103(a) as being unpatentable Ramamurthi et al. (US 5,306,555) in view of Frank et al. (US 2003/0077438) as applied above, further in view of Attey et al. (US 5,544,487).

Ramamurthi in view of Frank teaches the claimed invention above but fails to teach that the high thermal conductivity material conducts heat away from a localized heat load and emits it to the environment as required by claims 33 and 44, that the composite further comprises a heat sink, wherein the heat is emitted to the environment by means of a heat sink as required by claims 34 and 45, the high thermal conductivity material conducts heat way from a localized heat load to a process which uses the thermal energy directly as required by claims 35 and 46 and that the high thermal conductivity material conducts heat way from a localized heat load and into the device as required by claims 36 and 47.

Attey is directed to a thermoelectric system (Abstract). Attey teaches that a thermoelectrical module is a known type of heat pump in which the passage of an electric current through the module causes one side of the module to be cooled and the opposite side of the module to be heated. Thermoelectric modules are also known as Peltier modules or

thermoelectric heat pumps (column 1, lines 10 – 20). Attey teaches that within the thermoelectric system there is a gap between the walls and surrounding the thermocouples (column 8, lines 1 – 7). Attey teaches that the gap may be filled preferably with an aerogel material to reduce the transfer of heat by conduction, convection and radiation between the hot and cold sides of the thermoelectric module (column 8, lines 5 – 15).

It would have been obvious to one of ordinary skill in the art to use the aerogel composite in conjunction with a heat sink as suggested by Attey motivated by the desire to reduce the transfer of heat by conduction, convection and radiation between the hot and cold sides of the thermoelectric module. It should be noted that the use of the heat sink in conjunction with the aerogel composite of Ramamurthi in view of Frank would be capable of directing heat to a process which uses the thermal energy directly or a process which converts the thermal energy to electrical energy.

5. Claims 37 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramamurthi et al. (US 5,306,555) in view of Frank et al. (US 2003/0077438) as applied above, further in view of Nishimura (JP 032135545A).

Frank teaches that all materials known to the practitioner skilled in the art are suitable for the covering layers. They can be porous covering layers such as porous films, papers, textile or non-woven fabrics that permit air to penetrate the material and thereby enhance its acoustic dampening properties (page 4, [0049]).

Ramamurthi in view of Frank fails to specifically teach that the covering layer or Applicant's "high thermal conductivity material" can comprise carbon fibers.

Nishimura teaches a mat of electrically conductive carbon fibers (Abstract). Nishimura teaches that the carbon fiber mat is useful in insulating applications (USE/ADVANTAGE).

Since Ramamurthi in view of Frank lacks disclosure to specific types of nonwoven materials useful as covering layers, it would have been necessary and thus obvious for one of ordinary skill in the art practicing the invention of Ramamurthi in view of Frank to look to the prior art as exemplified by 032135545A to provide the details of the non-woven covering layers. As carbon fiber mats are useful in insulating applications, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use carbon non-woven mats as the covering layers in the invention of Ramamurthi in view of Frank motivated by the expectation of successfully practicing the invention of Ramamurthi in view of Frank.

Response to Arguments

6. Applicant's arguments filed May 10, 2005 have been fully considered but they are not persuasive.

Applicant argues that the wadding of Frank is not equivalent to Applicant's "lofty fibrous batting". As stated in the previous Office Action, "wadding" is defined a soft mass or sheet of short loose fibers used for stuffing or padding. According to page 11 of Applicant's Specification, a "lofty batting" can a soft web in sheet form or non-sheet form which is sufficiently open to be considered "lofty". Applicant additionally notes that "batting commonly refers to a fibrous material commonly used for lining quilts or for stuffing or packaging or as a blanket of thermal insulation". Although Frank and the current Application may not use the same

terminology, the wadding of Frank is a mass or sheet of *loose* fibers. The Examiner submits that the loose fibers would provide Applicant's sufficiently open structure.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the high thermal conductivity material is present *within* the x-y plane of the composite) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The Applicant claims that the high thermal conductivity material is present "*in*" not "*within*" the x-y plane of the composite. The Examiner has interpreted being "in the x-y plane" to encompass a covering layer which shares an x-y plane surface with the composite. If the Applicant requires that the metal layer be within the composite, the Applicant should amend the claim accordingly.

In response to applicant's argument that Frank and Attey are nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Frank and Attey are both concerned about insulation applications. Frank is directed to an aerogel and fiber-based acoustic and thermal insulation (See page 1) and Attey is directed to reduction of heat transfer between the hot and cold sides of a thermoelectric module by use of an aerogel (See column 8, lines 1 – 15).

In response to applicant's argument that Frank and Nishimura are nonanalogous art, it

has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Frank and Nishimura are both concerned about insulation applications. Frank is directed to an aerogel and fiber-based acoustic and thermal insulation (See page 1) and Nishimura teaches that the carbon mat may be used in heat-insulating applications (Abstract).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Boyd whose telephone number is 571-272-1473. The examiner can normally be reached on Monday thru Friday (8:30am - 6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on 571-272-1478. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer Boyd
August 4, 2005

Ula Ruddock
Ula C. Ruddock
Primary Examiner
Tech Center 1700